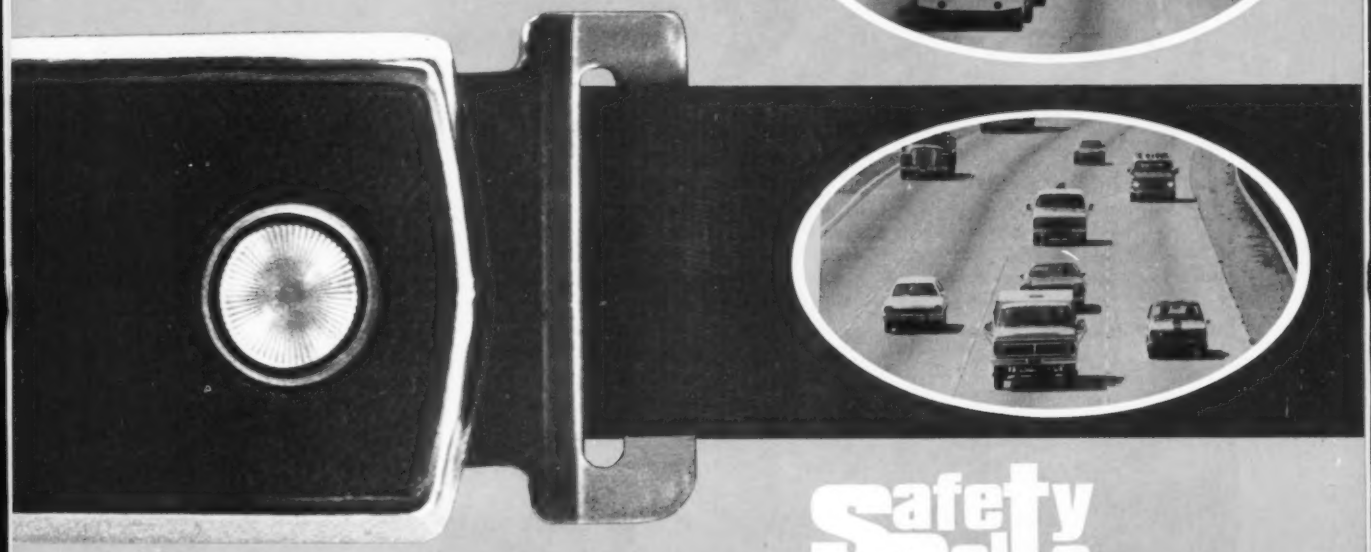
DECEMBER 1984

DRIVER

A Buckle-Up BONANZA



Safety Belts
SEAT BELT LAWS

Safety Belts
THE SECOND COLLISION

Safety Belts
YESTERDAY, TODAY AND TOMORROW

Safety Belts
THE HISTORY OF SEAT BELTS

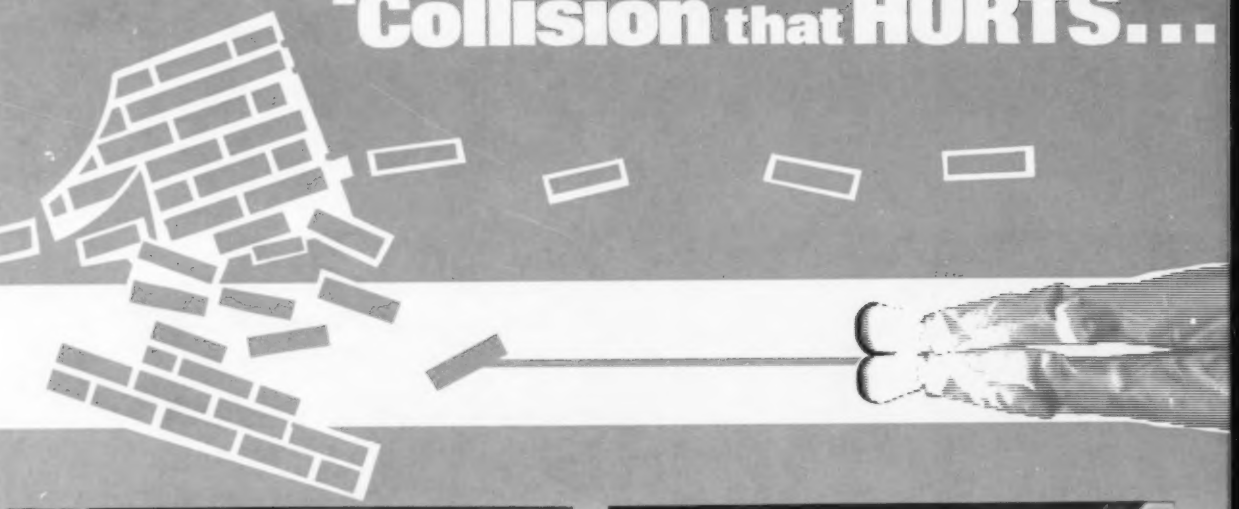
Safety Belts
GAINING 1800 SAFETY POUNDS

Safety Belts
THE MYTHICAL BELT TALES

- THE BACKYARD MECHANIC
- DRIVING AT SHEPPARD
- YOU'D THINK PEOPLE WERE INVISIBLE

DRiVER

It's not the FIRST Collision that HURTS...



Every accident, even a simple accident like one car hitting a signpost, is a multiple collision. The first collision occurs when the car smashes into the sign and the second collision occurs when the driver hits the steering wheel and the dashboard. This "second collision" is the one that causes the injuries.

There is always a second collision. It is caused by a physical law called inertia, which states that an object will keep moving in a straight line until something stops it.

sudden deceleration, to spread the force of the collision over the body parts that can most easily take it.

The human body can take a lot of stress if that stress is spread over a wide area. A large amount of force applied to a small area is what causes severe injuries or death, and this often happens in the auto accident involving the unrestrained person. He strikes a car interior part at one point of his body and that point must take the full force of the impact. In contrast, the belted-in occupant has the force spread over his whole

continued

...It's the TWOth

2 the SECOND COLLISION

Head injuries 47.7%
Fracture of spine and trunk 8.3%
Internal injury of chest, abdomen and pelvis 37.3%
Fracture of limbs 2.0%
Other injuries 4.7%

You have all experienced inertia. When you turn a corner in your car, your body leans in the direction you were going before the turn. When you stop your car suddenly, your body snaps forward, attempting to continue the car's motion.

When the car's sudden turn or stop is caused by a collision (the "first collision"), your body continues the car's motion until it collides with something — the steering wheel, the windshield, or other parts of the car (the "second collision").

Or the seat belt. The seat belt is another part of the car your body might collide with, if you're buckled in. That is its purpose: to provide something for the body to hit, to absorb the shock of

(far left)
A child seat is the only safe place for your little one when he rides in the car with you.

(near left)
No matter how strong you are, you can't hoid onto a child when you're involved in an accident. This 30-pounder would be torn out his mother's arms with 900 pounds of force in a 30 mph crash, which is a fairly slow-speed accident.

(right)
This shows the percentage of fatal injuries to various parts of the body. Head injuries make up nearly half the fatal injuries. Wearing a seatbelt with shoulder harness greatly reduces the risk of head injuries.

THE TRAFFIC SAFETY MAGAZINE FOR THE MILITARY DRIVER

DRIVER

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AND SAFETY CENTER
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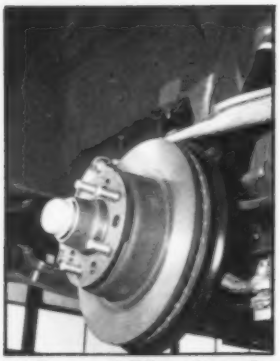

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Maj. Gen. JOHN H. MITCHELL
Director of Safety
United States Army

Como. JERRY C. BREAST
Commander
Naval Safety Center

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Safety Education Division

VIRGINIA A. HENDRIX
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TSgt. RON LATHROP
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continued

A simple act, that of buckling your safety belt, will protect you from the second collision. Whether you're driving to another city or just moving the car into the garage, always fasten the belt.

Without the belt, a crash sends your body slamming into hard surfaces at the speed the car was going before the impact.

chest and his abdomen across the strong pelvic bones.

As a booklet by the National Highway Traffic Safety Administration puts it, "The energy of the man must be dissipated by the body during the collision. Through use of a seat belt and harness, this energy is dissipated by the displacement of fluid and organs within the body with ruptures and hemorrhages often resulting. If a seat belt is not used, however, the energy is dissipated by the crushing of the body and the car as the passenger strikes relatively hard objects in the passenger compartment."

That makes it sound like there will be injuries even to the person wearing belts. Maybe. But the injuries will be much less severe. It is the difference between minor bruises to the body (with belts), and *crushing* the body (without belts).

Bruises: Here's an example. A friend of ours was involved in an auto accident that included a complete rollover. Even though the car was a mini-compact, the passenger compartment was intact. So was our friend, because she wore her belt. Her only injuries were very distinct bruises across her chest and abdomen, caused by the lap belt and shoulder harness.

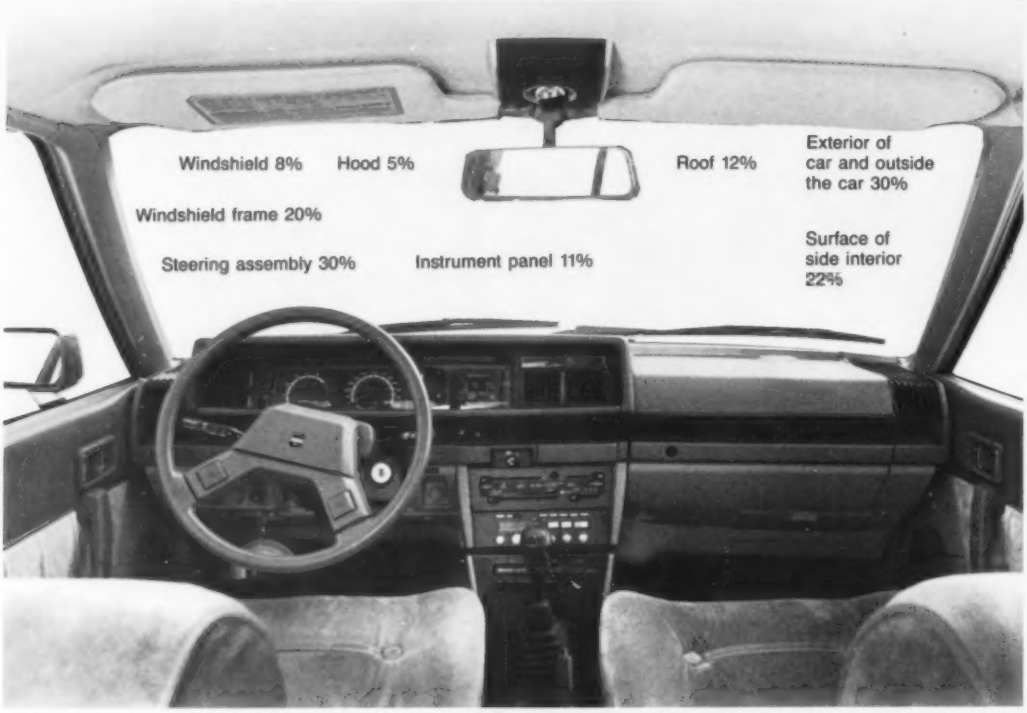
A note here: To all those who say seat belts cause injuries, we say "only minor ones such as our friend suffered." Imagine her injuries had she been thrown about inside the car, or even thrown out of the car. She would probably not have survived.

What we're saying is that you can't avoid the second collision once the first collision has happened. But the choice is between colliding with a steering wheel or "colliding" with a belt.

The belt not only spreads out the area over which you absorb the collision, it also lengthens the time during which you absorb it. This is what is called "riding down" the collision. If the person has more time to absorb the energy of the crash, he will stand a better chance of surviving. The amount of energy the body must absorb will be the same no matter what length of time is spent absorbing it.

Here's an example. If a car hits an immovable barrier at 30 mph, it will stop in about one-tenth of a second. The occupant of the car will continue to move at 30 mph within the car. One fiftieth of a second after the car has stop-

continued



This photo shows impact points of fatally injured people who were studied in a General Motors report. The percentages add up to more than 100% because some people were injured by hitting more than one object.

ped, the occupant will have the "second collision" with the steering wheel and other parts of the car. The occupant will have to absorb all the force of that collision in a hundredth of a second. And he'll absorb it by hitting objects that are hard.

On the other hand, if he's wearing a belt, the force of the first collision will cause his seat belts to lock up and he will absorb the shock again the harness in the tenth of a second it takes the car to stop. In effect, he becomes a part of the car, using the longer time that the car absorbs collision energy. The unrestrained occupant becomes like a projectile within the car.

Here's another example: A family driving in their car came to an intersection, where they stopped, then proceeded through. Another car failed to stop for the sign and hit the family's car. The parents, in the front seat were wearing their belts and suffered no injuries. Their son, unrestrained in the back seat, was thrown across the car into the door and the window crank injured his spine.

They all endured the same collision, and the same forces were acting on all the occupants of the car. Yet, the parents "rode down" the collision; they had the force spread over a longer time, and spread over the length of their belts. The son had to absorb the impact all at once, and the impact was concentrated at one point of his body.

And we should point out that this accident happened at a fairly slow speed.

Impact points: General Motors did a study of accident fatalities several years ago to show what interior car parts had injured the victims. Thirty percent, or nearly a third,, were fatally injured by hitting the steering assembly. The windshield accounted for 8 percent of the injuries, and the windshield frame added another 20 percent (see illustration).

Studies have shown that nearly half of the fatal injuries in auto accidents are head injuries. These, added to the internal injuries of the chest and abdomen, account for about 85 percent of the fatal injuries. And these are precisely the parts of the body that seat belts are designed to protect, by keeping them from hitting the interior car parts listed above.

Today's seat belt is a good design. The lap portion of the belt fits snugly over the pelvic (hip) bones to hold the body within the car and in the seat. If

continued

WITHOUT THE BELT

On impact, the car begins to crush and to slow down. The person inside the car has nothing to slow him down so he continues to move forward inside the car at 30 mph.

0.000 seconds - car hits barrier

The car slows down as the crushing of the front end absorbs some of the force of the collision. The person inside is still moving forward at 30 mph.

0.050 seconds - car crushes

One-fiftieth of a second after the car has stopped, the person slams into the dashboard and windshield. This is the human collision. In the car's collision it takes 1/10 of a second to stop; in the human collision it takes only 1/100 of a second.

0.100 seconds - car stops **0.120 seconds - person hits car interior**

WITH THE BELT

On impact, the car begins to crush and to slow down.

As the car slows down, the person moves forward until the seat belts restrain him. The belts keep him in his seat and keep his head and chest from striking the car interior.

Being fastened to the framework of the car, belted occupants are able to "ride down" the collision as part of the car. They are able to take advantage of the car's slower stop, as it crushes and absorbs energy. For belted people there is no human collision.

continued

worn alone, however, the lap belt allows the body to bend forward at the waist in a front-end collision and hit the steering wheel and dashboard. This problem is eliminated by the shoulder belt. It runs diagonally across the chest and holds the body away from those hazards. It also allows the force of any accident to be spread across the chest, one of the stronger parts of the body.

The way in which the seat belt does its job of stopping the second collision is simple. The reel for the belt has a ratchet that locks up in an emergency. One type is sensitive to movements of the car, and the other is sensitive to movements of the belt itself. The former is the type used on most newer cars. If you want to test whether your seat belt locking system works, there is a way. If the car has a belt-sensitive system, sit in the seat and buckle the belt. Take hold of the shoulder belt and pull outward sharply. The belt will lock up within a couple of inches of your body, just as it would in an accident.

If your car has car-sensitive belts, you need to test them with the car in motion. Find an empty section of road and drive along slowly. It is not necessary to be driving fast; five to ten miles per hour is fast enough. Apply the brakes hard. The belt will lock up. By the way, try this only on a dry, level, paved road with no traffic nearby.

Myths: Before we leave this discussion of the second collision, we want to attack a couple of widely-held myths. The first is the idea that you can brace yourself against the second collision.

Many people think they can brace themsevles with their hands or arms. Maybe they can, at speeds less than five miles per hour. But at the moderate speed of 30 mph, an auto collision would throw your body around with a force equal to 30 times your weight. So if you weigh 150 pounds, you'd have to be able to hold 4,500 pounds. We don't know anybody who can hold up 4,500 pounds besides Superman or the Incredible Hulk.

The figure of 30 times relates to the second bit of popular nonsense, the idea that a parent can hold his child on his lap and protect it from the second collision. The figure of 30 times makes holding a 10-pound infant the same as trying to hold 300 pounds. Get the idea? Unless you're one of the two gentlemen we mentioned, we suggest you buckle up, and buckle your children in, too.

HOW CAR-SENSITIVE EMERGENCY LOCKING RETRACTORS OPERATE

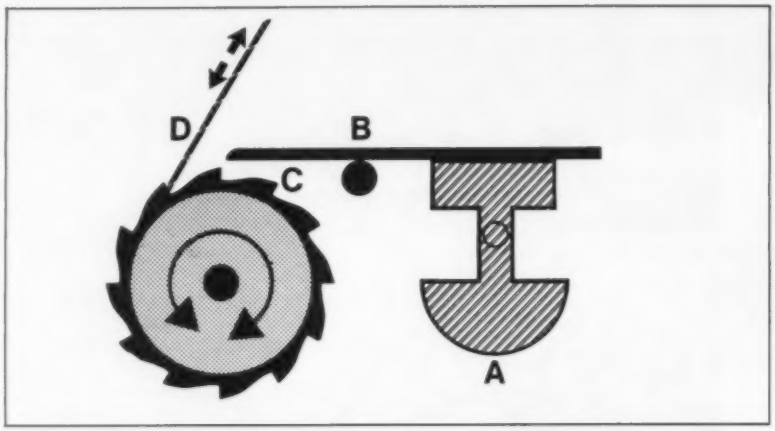


Figure 1—NORMAL CONDITIONS
Under normal driving conditions the pendulum and bar in their normal rest positions. The reel which holds the belt is free to rotate. As the occupant moves forward, say to reach out to operate controls on the dashboard, the belt will move with the occupant.

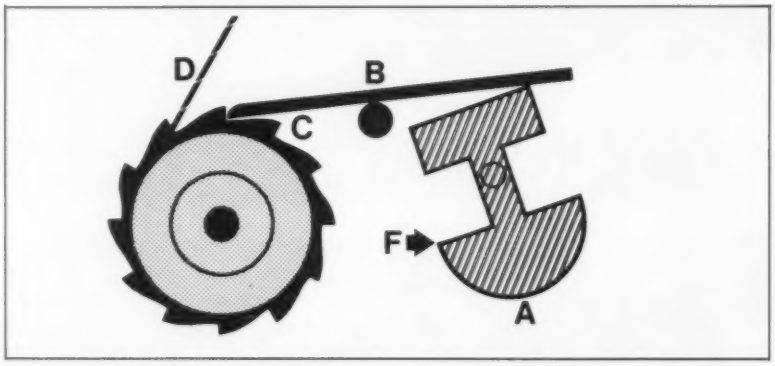
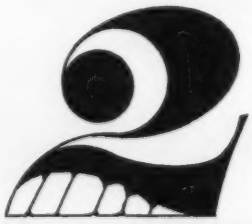
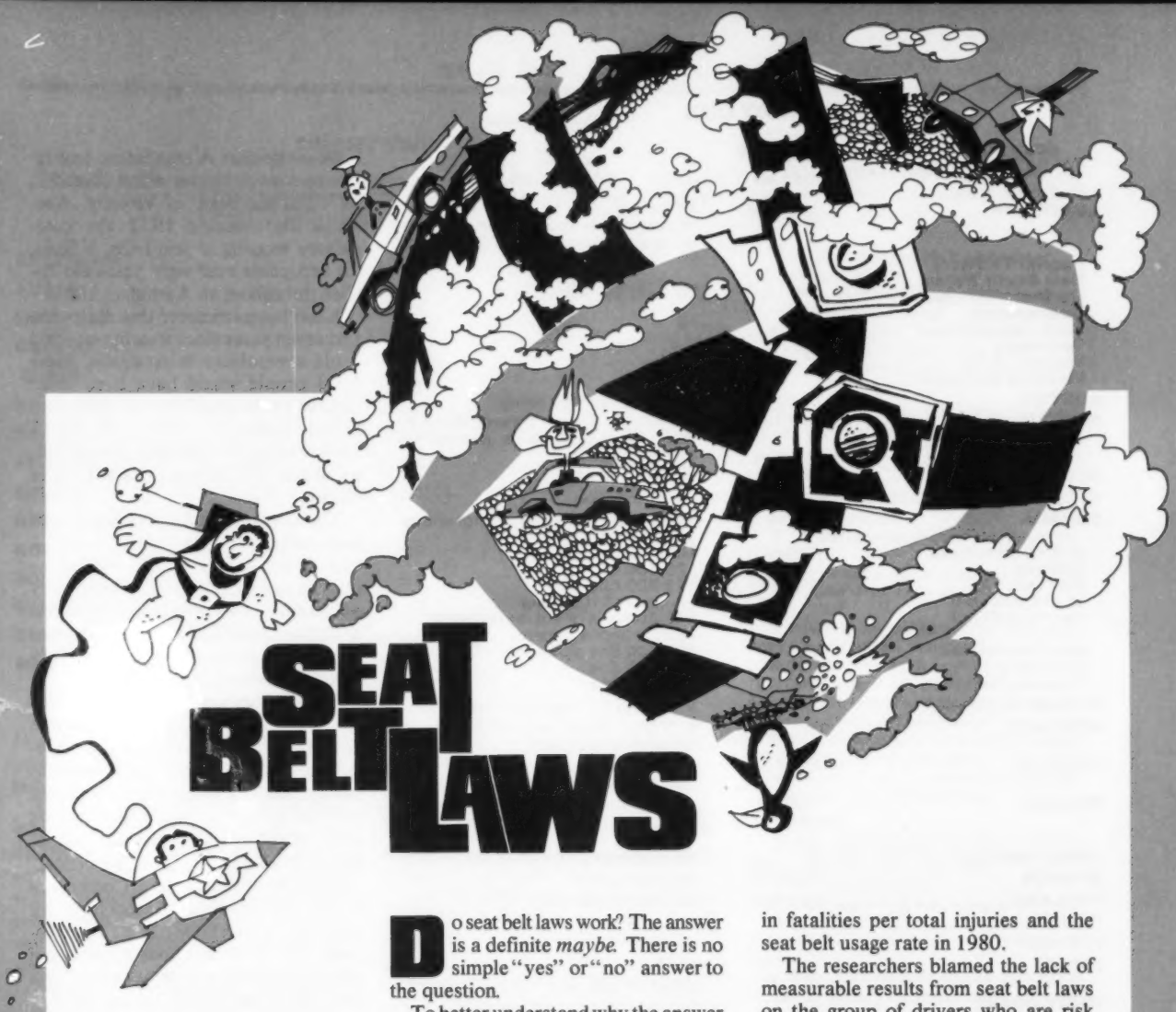


Figure 2—EMERGENCY CONDITIONS
Under emergency conditions, such as in a collision, the pendulum will move forward under the force of the impact (f) causing the bar to engage the ratchet. The reel and seat belt are now locked in place and the occupant is held firmly in his seat.

The majority of car-sensitive retractors use a pendulum (a) to sense an emergency condition and a bar (b) and ratchet (c) mechanism to lock the seat belt (d) in place.



We want to thank Transport Canada in Ottawa, Ontario, for the information and some of the illustrations in this article.



SEAT BELT LAWS

Do seat belt laws work? The answer is a definite *maybe*. There is no simple "yes" or "no" answer to the question.

To better understand why the answer is "maybe" let's look at the more than 30 nations that have already adopted mandatory seat belt use laws. Chart One shows the countries that have mandatory seat belt use requirements, the date the law took effect, the penalties for not wearing belts and the degree of enforcement.

A review of accident data collected by a number of these countries, before and after implementation of a mandatory use law, indicated that mandatory seat belt usage made a measurable impact on safety only after the passenger belt usage rate rose above 60 percent. Further, extremely high reductions in fatalities didn't happen until belt usage reached 80 percent or more.

Chart Two shows the countries involved in the study and their respective reductions in injuries and fatalities per miles driven as well as their reductions in fatalities per total injuries and the seat belt usage rate in 1980.

The researchers blamed the lack of measurable results from seat belt laws on the group of drivers who are risk takers (and who have the most accidents) because they are least likely to voluntarily comply with the laws. Therefore, until compliance goes above 80 percent and begins including these risk takers, they are still having more accidents than the other drivers.

The information gathered from the other countries also indicated that obtaining a user rate above 60 percent required rigorous enforcement programs. The researchers concluded that a mere seat belt law would be a futile gesture because the aggressive measures required for enforcement could come into direct conflict with our civil liberty traditions.[1]

continued

1

SAE Technical Paper 840329, Seat Belts: Effectiveness of Mandatory Use Requirements, by Roger L. McCarthy, Robert K. Taylor, Sally B. Sanford and Robert C. Lange, Failure Analysis Associates.

CHART ONE

COUNTRIES WITH MANDATORY SEAT BELT LAWS	EFFECTIVE DATE OF LAW	PENALTY (DEGREE OF ENFORCEMENT)
AUSTRALIA	72/01/01	Varies by state: Maximum $258 fine, maximum 6 months imprisonment (When motorist is stopped for another purpose)
Capital Territory	72	
New South Wales	71	
Northern Territory	72	
Queensland	72	
South Australia	71	
Tasmania	71	
Victoria	70	
Western Australia	71	
AUSTRIA	76/07/15	None (Essentially none)
BELGIUM	75/06/01	$18-107 fine, 1 day - 1 month imprisonment (when motorist is stopped for another purpose)
BRAZIL	77	No information
BULGARIA	76/07	No information
CANADA		(When motorist is stopped for another purpose)
British Columbia	77/11/01	Maximum $100 fine
Ontario	76/02/01	$20-100 fine
Quebec	76/08/15	$25-200 fine
Saskatchewan	77/10/01	Maximum $1000 fine
Newfoundland	81/07/14	$25-500 fine or not more than 3 months imprisonment
New Brunswick	83/11/01	$25-100 fine plus costs
Manitoba	84/04/01	$20-100 fine
Nova Scotia	85/01/01	$25-100 fine
CZECHOSLOVAKIA	69/01/06	Maximum $10 fine (No information)
DENMARK	76/01/01	$16 fine (When motorist is stopped for another purpose)
FINLAND	75/07/01	Undetermined fine, maximum 3 months imprisonment (Essentially none)
FRANCE	73/07/01 Revised 1979	Maximum $21 fine (When motorist is stopped for another purpose)
GREAT BRITAIN	83	No information
GREECE	79/1216	No information
HOLLAND	75/06/01	No information
HUNGARY	77/07	No information
IRELAND	79/02/01	No information
ISRAEL	75/07/01	$110 fine (Only requested to buckle up by officer)
IVORY COAST	70	
JAPAN	71/12/01	None (Essentially none)
LUXEMBOURG	75/06/01	$7 fine (When motorist is stopped for another purpose)
MALAWI	70	
MALAYSIA	79/04	No information
NETHERLANDS	75/06/01	Up to $120 fine (no information)
NEW ZEALAND	72/06/01	Average $8-$10 fine (When motorist is stopped for another purpose)
NORWAY	75/09/01	None, $36 proposed (Essentially none)
PORTUGAL		No information
PUERTO RICO	74/01/01	$10-$25 fine (Essentially none)
SOUTH AFRICA	77/12/01	No information
SPAIN	74/10/03	$15 fine (Essentially none)
SWEDEN	75/01/01 Revised 1980	$23.50 fine (When motorist is stopped for another purpose)
SWITZERLAND	76/01/01	$14 fine (When motorist is stopped for another purpose)
TURKEY		No information
USSR*	76/01/01	$1.50 fine (when motorist is stopped for another purpose)
WEST GERMANY	76/01/01	40 D.M. fine (Essentially none)
YUGOSLAVIA	75	No information

*Most autos are government-owned or are taxis; many do not have seat belts.

Down Under: A mandatory seat restraint law went into effect Dec. 22, 1970, in the State of Victoria, Australia. By January 1972 the compulsory wearing of seat belts, if fitted, for occupants over eight years old applied throughout all Australian States.

It has been estimated that during the first seven years since wearing was first made compulsory in Australia, some 4200 people would have been killed had the trend from 1960 to 1970 continued. That's in a country of only 15 million people — less than the individual states of California, New York or Texas.

The Australians have difficulty understanding why the United States — with a population of 200 million — doesn't simply introduce a mandatory adult seat belt wearing law. This puzzle is further complicated for them when they find our own medical people strongly favor such safety belts.

One of these puzzle pieces is a 1978 American Association of Automotive Medicine recommendation that categorical medical exemption from mandatory seat belt usage not be accepted and that any physicians recommending non-use will accept individual responsibility in so advising his or her patient.

Then there was the Sixth Conference of the International Association for Accident & Traffic Medicine that concluded in 1977 that governments and other appropriate authorities which have not enacted legislation making seat belt use mandatory are placing the road-using population under their administration at needless risk.[2]

The French Connection: Since July 1, 1973, the wearing of seat belts by front seat occupants has been compulsory in France. Thanks to informational campaigns conducted by public agencies and supported by scientific data, the rate of seat belt use has attained 95 percent on the highway and 75 percent on the rest of the road network outside of urban centers. Between

2
SAE Technical Paper 840192, Thirteen Years of Seat Belt Usage— How Great the Benefits, by Gordon W. Trinca,, Road Trauma Committee, Royal Australasian College of Surgeons.

continued

CHART TWO

COUNTRY	PERCENTAGE REDUCTION IN INJURIES PER MILES DRIVEN	PERCENTAGE REDCUTION IN FATALITIES PER MILES DRIVEN	PERCENTAGE REDUCTION IN FATALITIES PER TOTAL INJURIES	USAGE RATE (%)
AUSTRALIA	7.6	9.0	1.9	87
AUSTRIA	2.3	6.0	4.0	33
BELGIUM	12.6	15.0	2.5	87
CANADA				
Ontario	na	24.0	na	80
DENMARK	6.9	5.0	-2.3	75
FRANCE	21.7	29.0	8.8	80
IRELAND	15.8	7.0	-10.5	46
ISRAEL	2.6	18.0	15.8	80
NETHERLANDS	na	4.0	na	67
NORWAY	13.3	21.0	8.5	47
SOUTH AFRICA	na	8.0	na	62
SWEDEN	7.7	14.0	6.9	81
SWITZERLAND	9.4	10.0	0.5	81
WEST GERMANY	0.0	4.0	4.8	54

1972 and 1982, the fatality rate corresponding to the total vehicle fleet was reduced by approximatelly half.

The French believe that if seat belts were not worn, a 55 percent increase in deaths of front seat occupants would have occurred. On the other hand, if seat belts were worn by occupants in all seats 100 percent of the time, fatalities would have been reduced by another 30 percent.

In-depth investigations by PSA/Renault have shown that for all types of collisions, the fatality risk for front seat belted occupants is roughly half of that which exists for unbelted occupants. In addition, elimination of the risk of ejection gives the seat belt remarkable effectiveness not only in the case of rollover, but also in the case of side impacts.

Perfection of the seat belt through adding a retractor mechanism and better anchorage geometry have improved front impact protection by 33 percent, according to French researchers. They also state that front impact is, more than ever, the primary accident configuration responsible for serious or fatal injuries in belted occupants.

The French also found that the fear of not being able to unfasten seat belts in case of fire is not justified or warranted by the facts.[3]

The Swedish Affair: Seat belts started turning up in Sweden in 1955/6. While use was very low at first, it increased slowly to about 35 percent in 1974.

In 1975 a law came into force which made seat belt use compulsory for all drivers and front seat passengers who are at least 150 cm tall (about 5 feet) and more than 15 years old. Front seat belt use increased noticeably after the introduction of the law — to about 84 percent. It has since decreased a little to about 80 percent in 1983. However, seat belt use in the rear seat is still very low, averaging about 10 percent.

To a great extent children still travel unprotected because Sweden has no law as to how or where a child is to travel in a vehicle. While babies travel in carry-cots 80 percent of the time, children 4-10 years old are restrained less than 10 percent of the time. Belt usage increases at age 11.

3
SAE Technical Paper 840193, Ten Years of Safety Due to the Three-Point Seat Belt, by F. Hartemann, C. Henry, G. Faverjob, C. Tarriere, C. Got and A. Patel, PSA/Renault Laboratory.

The Swedes found that the most important factors influencing seat belt use are:

1) Attitudes and risk appraisal,
2) Age and sex,
3) Trip distance and velocity standard of the road,
4) Design and handling characteristics of the belts, and
5) Existence of belt reminders.

Surveys by the National Swedish Road Safety Office have shown that seat belt use:

- **Increases with increasing driver/passenger age**
- **Is particularly low for younger men**
- **Increases with increasing trip distance and velocity standard of the road**
- **Increases with comfortable and easily handled seat belts**
- **Increases with belt reminders**
- **Increased to a marked extent when the mandatory seat belt wearing law was introduced**
- **Is influenced to a certain extent by campaigns providing information about the course of accidents and their consequences**

Volvo investigations have shown that:

- **Belt wearing not only prevents severe and fatal injuries, but also less severe injuries to a great extent.**
- **Belt wearing reduces the total risk of injury by more than 35 percent.**
- **Severe and fatal injuries are reduced to a greater extent than minor and moderate injuries.**
- **The belt is more effective and the risk of injury (belted or unbelted) is smaller for children than for adult passengers, concerning both severe and less severe injuries.**
- **Belt wearing primarily reduces head injuries and severe chest injuries.**
- **Due to belt use, there is a small increase in minor to moderate chest injuries. Most of these are bruises and slight pain, however.**
- **The risk of injury, concerning both severe to fatal injuries and less severe injuries does not lessen if an unbelted passenger moves from the front seat to the rear seat.**

continued

seat belt laws

continued

■ An unbelted rear seat passenger is a potential killer of the front seat occupants.
■ Many parents feel unsure as to how and when to use child restraints. The basic rule applying to the transport of children is that they must always be restrained.

Swedish researchers have made these recommendations for possible future measures:

1) **Installation of seat belts in older cars.**
2) **A subsidy in some form for the installation of rear seat belts.**
3) **Film sequences from collision tests and simulated road accidents should be shown repeatedly on TV.**
4) **"Personal" information campaigns, directed towards certain groups, e.g. parents, baby care centers, schools.**
5) **A law making the use of rear seat belts compulsory, applying also to children.**

According to official Swedish calculations, the number of people injured was 12 percent less than expected and the number of severely injured 20 percent less after the introduction of the mandatory belt use law. The financial gain to the community was estimated to be some $33 million in 1975 alone.[4]

[4] *SAE Technical Paper 840194, Seat Belt Usage in Sweden and Its Injury Reducing Effect, by Hans Norin, Gerd Carisson and Johnny Korner, Volvo Car Corp.*

1885
Seat belt used on horse-drawn vehicles to prevent ejection

1910
Leather seat belt used on U.S. Army Plane No. 1 to prevent ejection

1922
Seat belt used by Barney Oldfield in his race car

1926
Seat belts required in open-cockpit commercial airplanes

1935
Factory-installed seat belts advocated by C.J. Strickland, founder and President of Automobile Safety League

1940
Cornell Aeronautical Laboratory initiated the Automotive Crash Injury Research (ACIR) program

1949
Factory-installed seat belts offered by Nash

1955
Factory-installed seat belts offered by Ford

1961
Society of Automotive Engineers issued Standard J4, an industrial standard upgrading automotive seat belts compared with aircraft belts

1961
American Seat Belt Council (ASBC) was formed to establish and monitor industry standard

1963
Car manufacturers installed seat belts in front outboard seating positions on 1964 model year new cars with delete option

1963
SAE issues Standard J4a, ammending J4 to incorporate additional requirements as the result of intensive development and testing

1964
Mandatory installation of front outboard seat belts in new cars sold in 12 states

1964
Car manufacturers installed seat belts in front outboard seats in all new 1965 model year cars, with no delete option

1965
SAE issued Standard J4c which became the basis for a federal standard

1966
Car manufacturers install seat belts in rear outboard seating positions in all new 1967 model year cars

1967
First production installations of emergency-locking retractors in Shelby-American GT 350 and GT 500

1968
FMVSS 208 takes effect, requiring seat belts in all forward-facing seating positions and shoulder straps in front outboard seating positions

1970
Australia province Victoria adopts mandatory seat belt use law

1971
FMVSS 208 amended to require passive restraints, effective 1973 (later deferred)

1972
TRANSPO 72 held in Washington, D.C. Volkswagen displayed seat belt system with pretensioner

1975
First production tension-relieving device on shoulder strap

1979
Dual-spool retractor introduced on Chevrolet light trucks

1975
Continuous-loop system introduced on Cadillac Seville

1983
Dual-spool retractor with manual lock-up of lap belt retractor introduced on 1984 Corvette

the MYTHICAL BELT TALES

Applying the lessons from some old classics to some tales told today

When we were children, we enjoyed all the myths of ancient Greece and Rome because they were full of excitement and adventure. They had dungeons, dragons, heroes, sorcerers and monsters, because anything is possible in fiction. Aside from the fun, we discovered that the myths had some truth attached to them, in the form of morals. The morals were designed to teach lessons about life in an entertaining way, and they were very effective in doing that.

Some of the lessons can be applied to something as commonplace and nonheroic as using a seat belt when driving an automobile. What we're doing here is comparing the classics with some classic excuses for leaving the belts on their take-up reels. Sound a little farfetched? Read on.

Just a short hop: One ancient story told of Daedalus, an inventor who designed the Labyrinth, a maze so complicated even he couldn't get out of it. When he and his son Icarus were imprisoned there, he made wings out of feathers and wax so they could fly out. He told Icarus not to fly too close to the sun or the heat would melt the was and he would fall into the sea. Icarus flew too high anyway and, or course, the wax melted and the wings fell apart. Without the special wings, he couldn't fly at all. He then found out that he also couldn't swim. One lesson here is to be cautious, even when you think you're perfectly safe.

One occasion you might think you're safe is when you drive a short distance — "I'm only going to the store." People often think it's not necessary to buckle up when they're going on a short hop or traveling at slow speeds. They feel they are in no danger. Icarus probably had no intention of overdoing his high-flying, but see what happened to him.

The truth is that most accidents happen within 25 miles of home. Further, 80 percent of all accidents happen at 40 miles per hour or less. You are not perfectly safe from an auto accident any time you are in the car, and that includes when you are in a parking lot.

With the belts, you'll be protected from injury, just like Daedalus. Without them, you could find yourself in a real fix like Icarus – flying without a comfortable place to land.

All tied up: You probably all remem-

ber the story of Odysseus (or Ulysses). He was sailing on his way back home after the Trojan War, and he wanted to hear the sirens' song, a sound that lured many sailors to their deaths on the rocks. He had his men tie him securely to the mast, while they stopped up their ears with wax so they would sail on without hearing. When he heard the sirens, however, he tried to get his men to free him. They couldn't hear him and the ship got safely away from the area.

Perhaps one way of looking at this story is that sometimes it's wiser to be restrained. Odysseus was fine until he heard the song and suddenly decided he was too confined.

Just like this popular ancient myth, there is a popular myth today that the straps on modern automotive seat belts are confining and uncomfortable. In fact, the belts and the shoulder harnesses are adjustable. Especially on the newer cars, the belts can be set so that you are very comfortable and so that you can move easily to reach anything in the car. The next time you feel you are too confined in your seat belt, just adjust the belt for your comfort and remember that there are worse things than being restrained. There are the rocks, and there is the modern day sirens' song – the ambulance.

Fatal weakness: Another popular story is of the hero Achilles, one of the Greek generals in the Trojan War. Achilles was not only a great warrior, he was also invulnerable to any harm, except in one heel. When he finally joined the fighting, he almost single-handedly won the war until he was killed by an arrow that hit him in that vulnerable heel.

The moral of that story is that everybody has his own weakness (or "Achilles' heel").

Obviously, the chances of Achilles being injured in that one vulnerable spot were very small. And some real people seem to believe they have the same resistance to injury that Achilles had. They say things like "I don't need to wear the seat belt; it's safer to be thrown clear of the car." These people don't realize the odds are not in their favor. They have far more weak points than just a heel.

Ordinary human bodies are very breakable and they cannot take collisions with hard things like the ground or concrete roads or signposts. They also cannot take being crushed by their own vehicles, a common occurrence in roll-over accidents where the occupant is not belted in. In fact, a person is 25 times more likely to be killed if he is thrown out of the car than if he stays inside. Seat belts are designed to protect very vulnerable people like us against hitting hard, unforgiving ground.

A weighty matter: Hercules was probably the most famous of the old Greek heroes, renowned for his great strength. In one of the great adventures called the Twelve Labors of Hercules, he was told to obtain the Golden Apples of the Hesperides. He persuaded the giant Atlas to get them for him, while he took on Atlas' burden of holding up the sky. Atlas returned with the apples and Hercules tricked him into taking back the weight of the heavens.

The connection we'll draw between this and seat belts is this: Your strength has to be equal to the task, as Hercules' strength was to holding up the sky. Many people think they do not need to use their seat belts because they can brace themselves against the steering wheel or the dashboard or the seats. However, in order to do that, they would have to be as strong as these mythological heroes. This is the reason: Physical forces during an accident are so great that, even in a low speed crash, we ordinary humans would have to be able to support many times our own weight in order to survive (see "The Second Collision" in this issue). The nylon webbing of the seat belt and shoulder harness do what our own muscles cannot – keep us out of harm's way.

All is vanity: Queen Cassiopeia was a very vain woman, and she made the mistake of saying that she was more beautiful than the daughters of the sea god. Her claim angered the gods so much they ordered her to sacrifice her daughter Andromeda to a sea monster that was eating the people. Her daughter was later saved by a hero named Perseus, but here's the point we want to make: Her claim might have been true, but there were other considerations that were more important than her vanity.

Vanity seems to be behind one of the most common reasons given for failing to buckle up. That is, "The belt will wrinkle my clothes." We'll make the same statement: That may be true, but there are more important considerations, like being injured or killed. Make the sacrifice of a few wrinkles to your clothing, rather than risking the sacrifice of your life or health.

Chariots afire: Apollo, the sun-god, was always portrayed as driving his flaming chariot across the sky once each day to give the world its light. There's no moral in this, but the image of a fiery chariot reminds us of a common present-day fear.

Many people believe a myth that if they have an auto accident, their car will automatically burst into flame. They say if they use the seat belt, they might be trapped in a burning car. (These same people usually express a fear of the car being submerged in water.) So there are actually two fears here, that of fire (or water) and that of being trapped inside the car.

First, let's take the fire myth. Contrary to what you see on television, where every car seems to burst into a fireball upon impact, fire in an auto crash is a rare occurrence. The fact is that taken together, fire and submersion in water happen in only one half of one percent of all accidents.

But perhaps the more important consideration is the fear of being trapped. The seat belt buckle mechanism is very simple and easy to unlatch; it will not trap a person.

A far more realistic fear is of being rendered unconscious by a crash and therefore unable to get out. Here, the seat belt proves itself a life-saver once again. By holding the occupant in place and away from doors, windshield and steering wheel, the belt helps keep the occupant conscious and enables him to make a quick exit from the car.

Dangerous myth: After the Greek hero Jason found the Golden Fleece he married Medea, who had helped him in his adventures. Later he decided to become engaged to another woman and to exile Medea. Understandably angry, Medea got her revenge by giving Jason's new bride a robe that she had soaked in very poisonous drugs. The bride put it on and died.

We're citing this story because it reminds us of a modern day story that some people seem to believe. This is usually stated something like "Good thing I wasn't wearing my seat belt; I would have been killed." This statement gives the impression that you might be safer without the belt. That, like the story about Jason and Medea, is a myth.

We don't believe myths; we just make use of the lessons they teach, if those lessons are true. We hope you have had a little fun with us, looking at the old classic myths in a slightly different way. Try thinking about them the next time you use one of the above excuses to avoid buckling up.

Safety BELTS ...Yesterday, Today and T

Nearly 100 years ago some people recognized the usefulness of safety belts. Yet it has been only in the last 20 years that any real progress has been made with these life savers. And many people in this country still fail to use the safety belts installed in their vehicles although they believe in the belts' effectiveness.

Belts were used on horse-drawn vehicles as early as 1885 to keep people from being tossed out by rough roads. In 1910, the U.S. Army's first plane had a seat belt. By 1922, Barney Oldfield had equipped his racer with a seat belt. Of course these safety devices were nothing more than leather belts crudely attached to the seat or vehicle frame. It wasn't until the 1950s and '60s that any real efforts were made toward improving seat belt design.

Early aircraft-style webbing-to-metal buckles were quickly replaced with metal-to-metal designs. Non-locking retractors were followed by automatic-locking ones. By the mid-60s, upper body restraints were being studied.

Because of the continued downsizing of cars and increasing numbers of front-wheel-drive models, seat belt buckles have been designed to sustain the higher loads that restraint systems are put under during accidents in these smaller vehicles. In addition, buckle designs and installation are being reviewed to allow modifications that make it easier to put on and take off safety belts.

The belt pre-tensioners introduced by Mercedes-Benz may very well provide a new dimension in protection against fatalities and severe injuries in higher-speed accidents. These pyrotechnic pre-tensioners retract and preload the belt by rotating the retractor spindle, thereby eliminating slack in the belt. This, in turn, reduces the time between when the car impacts and the belts tighten (the timing difference is in milliseconds).

By eliminating the slack in the lap portion of the three-point safety belt system, submarining (sliding under the belt) and the resulting abdominal injuries may be prevented.[1]

Surveys have shown that Americans prefer two-retractor systems to the single emergency-locking retractor. The later system uses a continuous length of webbing for both the lap and upper body portion of the seat belt assembly working off a single retractor. The two-retractor system, as the name implies, uses two retractors — one for the lap belt and another for the shoulder belt.

To reduce weight, complexity and

Tomorrow

cost in two-retractor systems, and to increase comfort, convenience and reliability, a "dual-spool" system first appeared in 1979 vans and 1980 light trucks.

An additional feature was added to the "dual-spool" system when it appeared on the 1984 and later model Corvettes. To please drivers who like the secure feeling of a snug lap belt, the emergency-locking retractor on the lap belt portion of the three-point system has a manual locking mechanism. This same feature may be added to the front passenger location of family cars in the future to provide a convenient, positive, continuously-locked condition for securing child restraints.

Legislative and regulatory actions have had considerable effect on seat belt development and installation. And some day soon such actions may actually begin to impact belt usage in this country.

On Jan. 1, 1964, legislation took effect in 23 states that prompted all car manufacturers to begin installing seat belts in all passenger cars. Before that, seat belts had basically been an "after-market" item.

The National Highway Traffic Safety Act of 1966 enabled the National Highway Safety Bureau (NHSB) to issue the "Initial Federal Motor Vehicle Safety Standards" in 1967.

Dr. William Haddon, the original NHSB director, believed that the most effective way to bring the highway traffic deaths and injuries "epidemic" under control would be "passive" or "automatic" devices such as air bags or automatic seat belts. Dr. Haddon's successors as administrators of the National Highway Traffic Safety Administration (NHTSA replaced NHSB) followed his direction on this subject until Raymond Peck amended that standard in October 1981.

On July 11, 1984, the Department of Transportation (NHTSA's parent organization) ruled that if states containing two-thirds of the country's population were to enact seat belt laws by April 1, 1989, then installation of automatic (passive) crash protection devices would not be required in new cars.

The 16 most populous states containing the necessary two-thirds of the population are:

STATE	POPULATION
California	21,724,000
New York	17,659,000
Texas	15,280,000
Pennsylvania	11,865,000
Illinois	11,448,000
Ohio	10,791,000
Florida	10,416,000
Michigan	9,109,000
New Jersey	7,438,000
North Carolina	6,019,000
Massachusetts	5,781,000
Georgia	5,639,000
Virginia	5,491,000
Indiana	5,471,000
Missouri	4,951,000
Wisconsin	4,765,000

Needless to say there is another side to the legal aspects of seat belts: litigation. Lawsuits can result from either the use or non-use of available seat belts.

Some suits may allege that the injured plaintiffs were wearing seat belts that were defective and didn't provide reasonable protection. On the other side of the same coin, other seat belt wearers may believe that the belts are going to protect them from all harm in all events and bring suit when they are injured.

Non-use of seat belts is also becoming increasingly important in civil lawsuits. Courts are making it clear that if the individual doesn't use the available safety belts then s/he must share in the blame for his or her own injuries.

While surveys suggest that the general public feels that seat belts provide effective protection, the same people also find current systems uncomfortable and inconvenient. Yet there's research that says a committed seat belt user will use belts no matter how uncomfortable or inconvenient they are, while the determined non-user won't put on the easiest, most comfortable system.

However, the hard-core users and hard-core non-users make up only a third of the total vehicle-using public. The discretionary users — or two-thirds of the vehicle-borne population — are, of course, the target for all the programs aimed at getting people to use seat belts. And they're also the targets for the more comfortable and convenient systems of tomorrow.

This article is based on SAE Technical Paper 840392, Historical Perspective on Seat Belt Restraint Systems, by H. George Johannessen, OmniSafe Associates, Inc.

1
SAE Technical Paper 840395, Three-Point Belt Improvements for Increased Occupant Protection, by Juergen E. Mitzkus and Heinz Eyrainer, TRW Repa GmbH, Alfdorf, West Germany.

driving at Sheppard

by TSgt. PAUL ZIMMERLI
Sheppard Air Force Base, Texas

What was a car lies piled on its back amidst the wreckage of a Wichita Falls, Texas, business after the April 1979 tornado. Of the more than 40 deaths from the tornado, over half were people who climbed in their cars to out-run the tornado.

Driving conditions on and around Sheppard AFB, Texas, vary widely from day to day. Some cynics say minute to minute.

Much depends on North Texas' ever-changing weather, which can range from the teens in winter to the hundred-and-teens in the summer. Add high winds, torrential rains, snow, ice, sleet, hail, blowing dust and fog, in almost any combination, and there's always a potential for accidents.

For example, so-called black ice is a constant problem during the brief North Texas winter. Melting ice hidden in the shadow of bridges, overpasses and steeply-banked curves becomes transparent and covered with a thin film of water.

A notorious black ice "skating rink" is the curved, banked overpass on Spur 325 just a few blocks east of Sheppard's main gate on the main road to Wichita Falls. Add a 50 mph speed limit to the black ice, curve and bank and things really get hairy sometimes.

During the spring and summer, many heavy thunderstorms turn streets into streams due to often-inadequate drainage systems in many parts of Wichita Falls. One Sheppard NCO drowned in 1982 when his car was swept off a major roadway by floodwaters after a storm.

Blowing dust preceding thunderstorms from the west often reduces visibility in the summertime. The winds sweep dust from the prairies and occasionally mix the dust with rain for mudstorms. Keeping one's windshield washer reservoir topped off is recommended.

One driving hazard most North Texans quickly warn one of is tornadoes. During the 1979 tornado which leveled much of Wichita Falls, most of the deaths were people who jumped into their cars to outrun the tornado. Unless one is able to escape by driving at right angles to the tornado, driving tactics may be summed up in five words: *Get out and get down.*

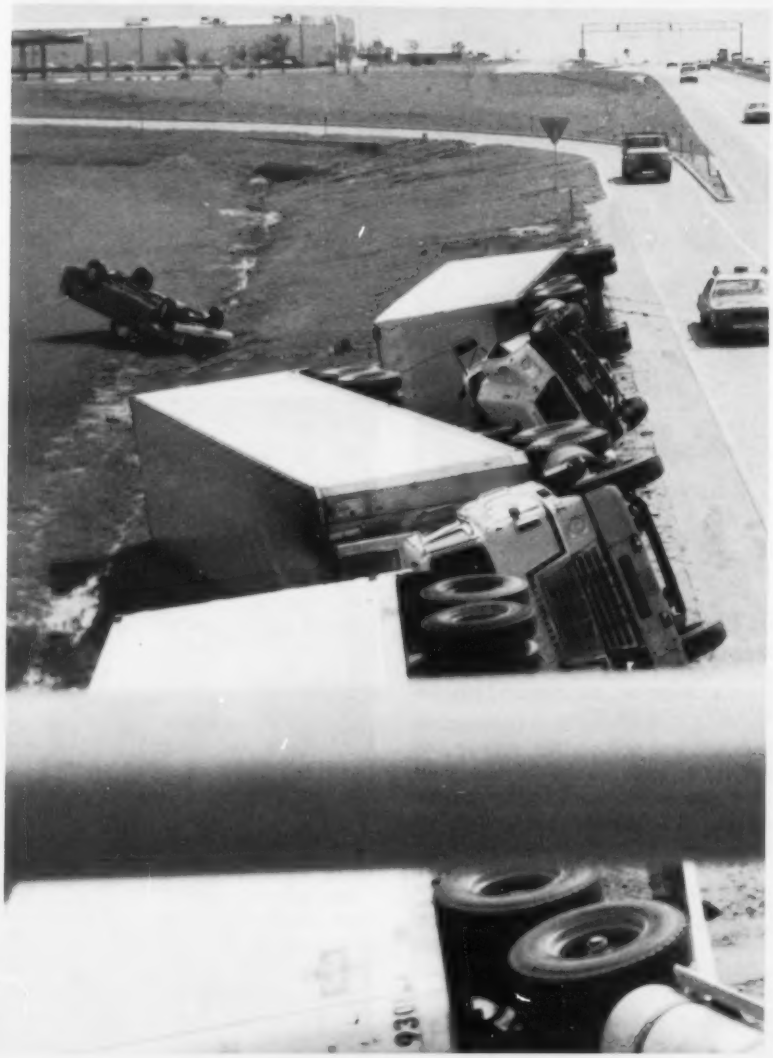
Should it snow or ice over, drivers are advised to drive *extremely* defensively. Since most North Texas winters are mild, the slippery-weather driving experience levels of local drivers are quite low. It's easy to get hit by a "learner."

Broad and Holliday Streets in Wichita Falls, two main one-way arteries, have timed-light arrangements, which extend for about seven lights. Theoretically, if one begins at the first light and does about 30 mph, one will make all the green lights. Don't bet your life on it! This is a double-hazard area. If you come rolling up to a light just as it turns green, don't go any further without checking the cross-street traffic. Like drivers the world over, there are some here who consider a yellow light to mean speed up and get through the intersection. By the same token, if the light turns yellow as you roll up top it, check your rear-view mirror before making your decision to stop or floor it. Is a tailgater there?

Sheppard itself has a few driving hazards to keep in mind. Most are mi-

This is the fifth in a series of articles about driving conditions at ATC technical training centers.

(above)
Troop formations are a constant driving problem for Sheppard people. It's okay to pass them — at 10 miles per hour — as long as the formation's marching supervisor waves one on.



(right)
This pile-up was caused by a "black ice" build-up along the edge of a local highway. Unfortunately, in the North Texas winter, this is an all too common sight.

nor, however, compared to off-base driving.

Two gates, the hospital gate and Missile Road gate, are the source of occasional fender-benders. Each has two lanes going in. Drivers turning left going in one of these gates at the same time as another driver turns right into the gate should stick to the appropriate lane. If either driver swings wide, it's crumpled metal time.

Student formations are another hazard. Approaching a group of marching students from the rear, one must slow to their pace. Do not go around them unless the individual marching alongside the formation waves you on, and then pass them at 10 mph. Once fully past the formation, one can resume the posted speed limit.

Overall, driving on Sheppard and in North Texas can be just like driving anywhere else. The key is alertness, courtesy and good defensive driving — just like the safety education people preach.

you'd think People were

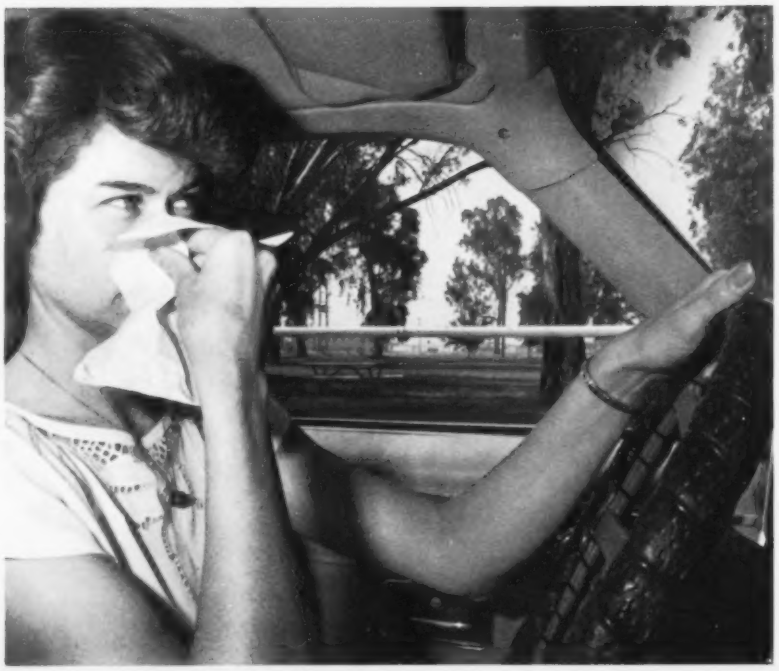
Adjustments should be made before getting underway. This includes seat position and the mirrors inside as well as out.

Reading is best left to the non-driving passengers of any vehicle. If you don't have a passenger, pull over and stop before unfolding the map.

(right)
Should you really have to blow your nose, maybe it would be better to pull off the road to do so. You'd be surprised at the number of accident reports that begin, "I sneezed and then . . ."

How you look is important, but it would be better to wait until you got to where you were going before grooming yourself. Otherwise you might run into somebody you hadn't planned on meeting.

If you eat or drink while you're driving, something is going to get spilled. At best you're going to look good in everything you eat. At the worst, you're going to spill yourself on the highway.



invisible

It's amazing the things people do in their cars while cruising the freeways and negotiating urban traffic hazards. Many of the tasks drivers undertake while moving down the road have nothing to do with controlling the vehicle. In fact, a lot of the things they do can lead to losing control altogether.

For example, there are the people who believe that cars are moving tables for fast-food restaurants. They always have something in their mouths. While they're gulping down a juicy half-pound burger, aiming fries for their mouth, slurping an extra tall drink and puffing on a cigarette their hands are so busy that they must use their knees to steer the car.

Others seem compelled to vocalize. As if singing along with the radio didn't distract enough of their attention to cause an accident, they insist on getting their whole body into the act. It's not bad enough that they are constantly bending over to tune the radio, adjust the volume or bass or balance and change the stations, some drivers lean to the center of the vehicle so they can hear the speakers in better balance.

Then there are those drivers who have to move to the music. They swing their arms and shoulders back and forth as if dancing as their cars hop and jump from lane to lane with their every move. Others keep the beat with their feet and their cars slow and lurch correspondingly.

Still others feel that in order to talk with somebody else in the car they have to face them. As a result their car also turns.

And then there are those drivers who take on all the traffic around them, addressing other drivers verbally and sometimes gesturing with arm, hand and finger signals their exact feelings. One wonders how they can possibly be in control of their vehicle if they are so out of control of their emotions.

Speaking of emotions, think about the loving couple where the passenger is sitting so close to the drive they look like one person. Is the car or truck really that hard to drive that it takes two people to do it? And if it does take two people to drive it, why has only one of them got only one hand on the wheel? Is either of them actually paying attention to the task at hand? And, finally, are the safety belts being used properly?

Singing along with the radio may be fun, but with your mind on the tune, how can you really be paying attention to your driving.

There's an old joke in which the passenger says, "Use both hands!" and the driver replies, "I can't; I have to have one to steer with."

Of course there are a lot of beautiful people out there. You can tell them because they are always looking at themselves in the mirror as their auto barrels along without their attention on the road. Others drive while combing their hair, applying make-up, removing make-up, brushing their teeth or tying full-Windsors. Some dry their nail polish while holding their fingers out the window.

While some drivers are fixing their faces and plucking spinach from over their front teeth, others are fixing their vehicles as they roll along. They're down under the dash tinkering with some wires, changing their seating position, adjusting the mirrors inside and out or cleaning the glove box.

But at least they're doing something. Some drivers use commuting time to catch up on their sleep! They travel along with their heads bobbing up and down as they fall in and out of sleep. Hopefully their changes in speed match up with any drivers ahead or behind them who might also be keeping time to the music.

Other drivers are bored with driving, so to occupy their time as they go along. No, they're not reading just the road signs and billboards; they're reading novels, magazines, newspapers, road maps, skywriting and the small print on the license plate frame on the car in front of them.

Then the more creative ones write while they drive. They write notes to themselves; they write notes to other people; they write novels; and, in some cases, they write stories about what people do in cars while they're driving.

Timely Topics

DOT RELEASES STUDY ON DRIVER EDUCATION

High school students who received special driver education courses emphasizing safety were involved in fewer crashes and had fewer violations during the first six months after they received their licenses, according to a study prepared for the Department of Transportation.

But after the first six months, there were no statistically significant differences among the three groups of students who participated in the 5-year study.

The study, conducted for DOT's National Highway Traffic Safety Administration (NHTSA) by Battelle Columbus Laboratories, Columbus, Ohio, covered 18,000 volunteer high school students in DeKalb County schools in Georgia. The students were divided into three groups of approximately 6,000 each.

The project was designed to test "the crash reduction potential of a quality, competency-based driver training program known as the Safe Performance Curriculum (SPC)." This course taken by one group of students involved 70 hours of instruction, including classroom, simulation, driving test course, and on-street training.

A second course — more typical of high school driver education courses but not quite as extensive — provided only the minimum training necessary to obtain a driver's license. Volunteers in this group received Pre-Driver Licensing (PDL) training. A third control group received no formal driver education. All three groups were monitored for two to four years to assess immediate, intermediate and long-term effects of the educational programs.

The study notes further that the positive short-term effect was offset by the fact that students who took driver education courses generally obtained their licenses earlier than those in the control group. Thus, the study concludes, "the net effect is no statistically reliable differences among SPC, PDL and control group students" in overall accident and violation involvement.

Other conclusions from the study demonstration project showed that females had significantly lower accident and violation rates than males, and that above average grade point students had significantly lower accident and violation rates than below average grade point students.

AUTO & TIRE DEALERS OFFER PROGRAM ON NEW DRIVE AGAINST DRUNK DRIVERS

An audio-visual program explaining how tough, new anti-drunk driving laws work and how to defend yourself against drunk drivers is now available to the public on a free-loan basis from more than 7,000 new car, truck, and tire dealers around the country.

Entitled "Drive Against Drunks," the 12-minute filmstrip explains the terminology of recently passed state drunk driving laws, points out telltale signs of the drunk driver, and offers advice on how to keep friends from driving drunk.

Dealers offering the program are members of the Dealers Safety and Mobility Council, an affiliate of the Highway Users Federation. The Council produces two audio-visual programs a year on traffic safety subjects for free loan to high schools and colleges, service clubs, church groups, and other interested organizations.

The "Drive Against Drunks" program includes a "leader's guide" which allows a program chairperson or teacher to moderate a 20 to 60-minute group discussion after the filmstrip is shown.

The program was developed following a nationwide survey of member dealers who identified drunk driving as a major community traffic safety concern. Although drunk drivers have gone largely unpunished and unchallenged over the years, recent public outrage has led to passage of laws which include stiff fines, license suspensions, and jail sentences for convicted offenders. "Drive Against Drunks" explains how these laws work and what terms like "legal *per se*," "implied consent," and "BAC" mean. It also examines which deterrents are most effective, and what more can be done in the community to reduce the drunk driving problem.

Most participating members of the Dealers Council also offer free-loan presentations on drugs and driving, proper safety belt and child restraint use, and how to maintain cars for safer operation.

For names of participating dealers in local areas, community organizations are invited to contact the Dealers Safety and Mobility Council, 5th Floor, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036, telephone (202) 857-1251.

Companies and organizations sponsoring the Dealers Safety and Mobility Council include American Motors, Chrysler, Firestone, Ford, General Motors, B.F. Goodrich, Goodyear, National Automobile Dealers Association, National Tire Dealers & Retreaders Association, Nissan, Toyota and Uniroyal.

TENTH ANNIVERSARY FOR CATALYTIC CONVERTER

The 1985-model year marks the beginning of the second decade that the catalytic converter has played an important role in the control of automotive exhaust emissions. Born out of General Motors early research in the 1950's, the automotive catalytic converter is an intricate combination of ceramics, rare earth elements, and modern technology that converts unburned fuel and toxic gases into harmless oxygen, nitrogen, water and carbon dioxide.

Introduced in 1975, the automotive catalytic converter became the first true "downstream" high efficiency emission control device. The catalytic converter gave development engineers their first opportunity to tune engines for both good driveability and fuel economy while still meeting increasingly tighter emissions standards. Since their introduction, catalytic converters have become the emission control device most widely used to meet the extremely stringent standards of today.

By comparison to an average 1960 car with uncontrolled emissions, the standards attained by today's emissions control systems represent a 96 percent reduction in unburned hydrocarbons and carbon monoxide, and a 76 percent reduction in oxides of nitrogen. Based on 1985 U.S. domestic sales estimates of 10.8 million passenger cars, this represents a reduction in exhaust pollutants of about 22 billion pounds annually. In more personal terms, this translates into an annual reduction of about 95 pounds of exhaust pollutants for every man, woman and child in the United States!

TRUE ACCIDENTS

Following are a few reports of accidents involving Air Force members. We have removed names and references to dates and places.

FLAT TIRE

Two airmen were traveling on a highway with a civilian friend when their car had a flat tire. The spare was also flat, so the airmen went to call a wrecker to tow the car away. While they were gone a highway patrolman came and helped the passenger get the car completely off the highway, onto the emergency parking lane. The patrolman left and the airmen returned to wait for the tow truck. All three were sitting unbelted in the car when another car, traveling at high speed in the emergency lane, rearended them. Both airmen died later in the hospital. The passenger had minor injuries. The other driver suffered major injuries, and was charged with vehicular manslaughter and driving while intoxicated.

ALCOHOL AND SPEED

An airman left base after a full day's work to drive 200 miles to visit his mother. He was drinking beer in the car. Traveling at high speed down a grade that led to a 90 degree turn, he lost control of the car. The speed limit for the curve was 30 mph. The car slid sideways off the road and hit two trees. The airman died later in the hospital of a fracture to the base of the skull. His Blood Alcohol Content was .12. Beer cans were found throughout the car and an open can was found wedged between his hand and the driver's door. Investigators blamed the accident on speed and intoxication, with fatigue as a contributing factor. The airman had a record of reckless driving habits, but not of excessive drinking.

HEAD-ON

Four Air Force members were driving south in one automobile on their way back to their overseas base. About 2.6 miles from the base, they rounded a slight right-hand curve and encountered a car that was passing another car. The Air Force member's car collided head-on with the passing car, and the cars came to rest about 32 feet apart. In the Air Force member's car, the driver and one of the passengers were pinned in the car because of the damage. They received serious injuries. The other two passengers were thrown out and killed. In the other vehicle, the driver was pinned inside because of damage to the car. A female front seat passenger was thrown into the dash and windshield and she was killed. A male passenger in the rear seat was thrown forward on top of the woman. Both men received critical injuries. Investigators determined that the foreign national's car was traveling 70-75 mph at the time of the crash, and the Air Force member's car was traveling 50-55. No one in either vehicle was wearing a seatbelt.

DISTRACTION

Two airmen were traveling north on a highway at a high speed. Witnesses traveling southbound estimated the speed at 70 mph. A witness said it looked as though the driver bent over to adjust the radio or to retrieve something. The car drifted off the right side of the road and hit a tree. Both occupants suffered multiple injuries and were pronounced dead at the hospital. Neither had worn a seatbelt.

UNFASTENED

An airman was returning to base on her motorcycle. She was traveling on the right shoulder of the road and suddenly, without looking to the rear, she turned left, directly into the path of an automobile. The driver tried to avoid her, but he hit the motorcycle broadside. At this time, the rider's helmet flew off. Motorcycle and rider tumbled 90 feet before stopping. She was taken to the hospital with critical head injuries. She died the next day. Although she was an experienced motorcycle rider and was wearing all the recommended protective gear, she had not properly fastened her helmet.

PASSING ON A CURVE

Four Army personnel and one airman were in one car driving toward an overseas air base. The road was a two-lane highway. The driver accelerated on a curve to pass several slow-moving vehicles. When he attempted to return to his own lane (the left lane) he was moving too fast to negotiate the curve. Trying to regain control, he locked the brakes while steering to the right. The car continued to the right, across the opposing lane, over a curb and into a concrete power pole and concrete wall. The airman received severe chest injuries and she died two days later. The driver and one of the passengers received minor injuries, and the other two passengers were hospitalized.

PARKED TRUCK

A sergeant was driving on a four lane divided highway at about 50 to 55 mph. The weather was foggy. At a point where the highway narrowed to two lanes, a one-ton flatbed truck was parked in the median with its rear sticking out almost six feet into the lane. Investigators concluded the sergeant saw the truck and tried to swerve to the right, from the 98 feet of skid marks his vehicle left. But he wasn't in time, and he hit the parked truck. The truck bed crashed into the passenger compartment of his vehicle and killed him. The investigators decided the contributing factors were the truck's position, the fog, the sergeant's speed (too fast for conditions), and alcohol. The sergeant had a Blood Alcohol Level of .06.

TRAIN

A sergeant was driving his car about 15 miles south of his overseas base. He made a right turn from one highway to another. Just after the turn, the second highway crossed an unguarded railroad track. The sergeant tried to cross in front of a slow-moving train but his car was struck and dragged about 120 feet. He was taken to a civilian hospital where he died about five hours later.

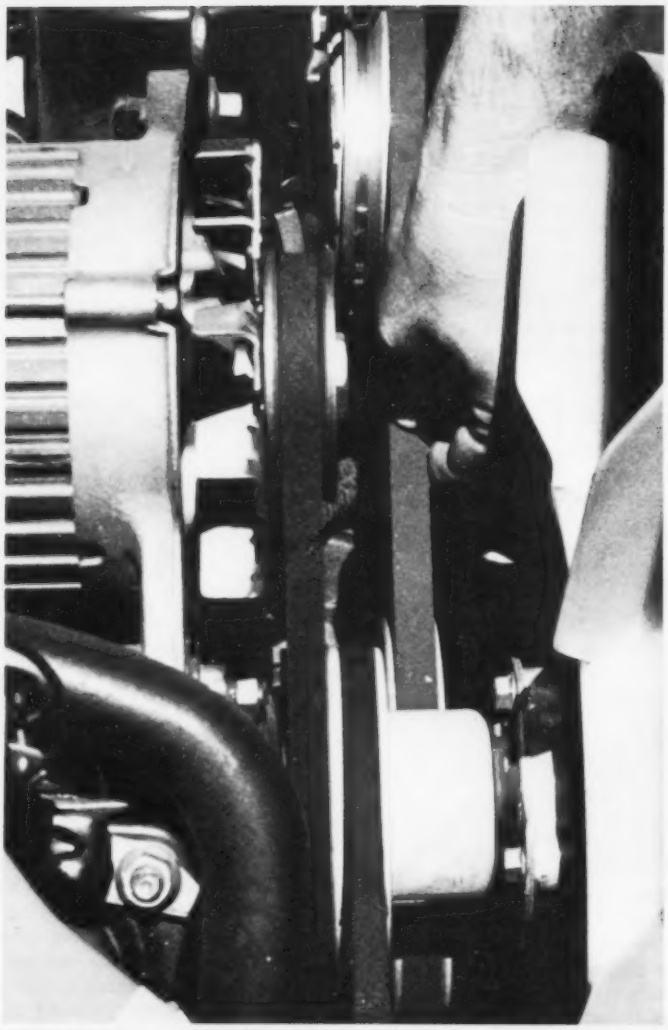
INTERSECTION

A staff sergeant left his home on his motorcycle to return to base after lunch. Traveling south on a highway, he came to an intersection where a station wagon was stopped. The station wagon driver did not see the motorcycle and started across the highway. The motorcycle hit the station wagon just behind the left door. The staff sergeant was taken to a local hospital, where he died three days later.

Shop Safety

OUCH!

by Capt. MIKE MALLOY
U.S. Army Reserves



Drive belts are the greatest hazard to beginning mechanics. Watch for their nip points.

Almost over night the average American has become aware of the money to be saved by keeping the family car properly tuned and in good running condition. With the advent of OPEC and its manipulations of the price of crude oil, along with a general nationwide inflationary trend, car owners became increasingly interested in having their cars operating at optimum efficiency.

To save even more, many people have enrolled in courses on automotive maintenance. These courses provide a wealth of information on the latest concepts Detroit has implemented. In one semester a student can learn basic fundamentals of the internal combustion engine and how to keep it operating within the parameters of factory specifications.

In most auto maintenance courses, great emphasis is placed on this concept while shop safety procedures are often neglected so other *more* important details can be covered. Because of this oversight, a novice mechanic can injure him or herself the first time in the shop. Such injuries can result in time lost from work, doctor bills and, of course, physical pain.

To shed light on the hazards of repairing an automobile, I will highlight some of the more common dangers. Each subject is broken down into problem/solution phases. The problem phase shows the most common types of mistakes and injuries which can happen while in the process of repairing the vehicle. The solution phase simply lists the correct procedures to follow while the repair work is taking place.

FAN BELTS

Problem: Fan belts are the greatest hazard to the beginning mechanic. There are numerous nip points around the front of a car that can cause severe damage to fingers. Belts can also launch a dropped wrench or screwdriver, hurling it through the air with great force. When a belt breaks loose, particles of rubber and strands of material, as well as the whipping action of the belt itself, could cause injury.

Solution: Simply being aware of the hazard is the most significant factor in eliminating fan belt accidents. Wearing safety glasses will also decrease the chance of injury.

JACKING

Problem: In lifting a car, many mechanics place the jack under the suspension which is not rigid enough to support such work. Occasionally, the car's emergency jack is used as the primary lifting tool with no backup support system. Then the mechanic climbs under the car with little thought of being crushed.

Solution: No matter what the reason, when a car is to be lifted off the ground, correct jack placement is of the utmost importance. The proper place-

ment is printed in vehicle shop manuals and many owner's manuals, as well.

If the proper shop manual is not available, use common sense. Place the jack cup on a flat spot where it can hold securely. But *never* put the jack under the floor board or on a suspension control arm. To do so means certain disaster.

Once the car is in the air, a safety stand must be in place before anyone climbs under the vehicle. The rated capacity of the stand must be more than the vehicle's weight. Placement of the stand is also critical. It should catch a solid, flat part of the frame in case the jack falls.

Never get under a vehicle until it is properly supported by safety stands.

BATTERY

Problem: To restore a battery's power, the mechanic needs a battery charger or a jump from a good battery. In the process, hydrogen gas is produced. This gas explodes with tremendous force when ignited by any spark or open flame.

Solution: When hooking up a battery charger, make sure it is turned off. No hydrogen will be produced unless the battery is electrically stimulated. Once the charger is hooked up, but not turned on, remove the battery caps and place a damp rag that has been dipped in water over the filler holes. This will absorb some of the escaping gases.

When jump starting a car, make sure that the final cable connection is to a ground as far away from the dead battery as possible. That way any sparks will not cause an explosion.

And never use a cigarette lighter or other open flame as a substitute for a

continued

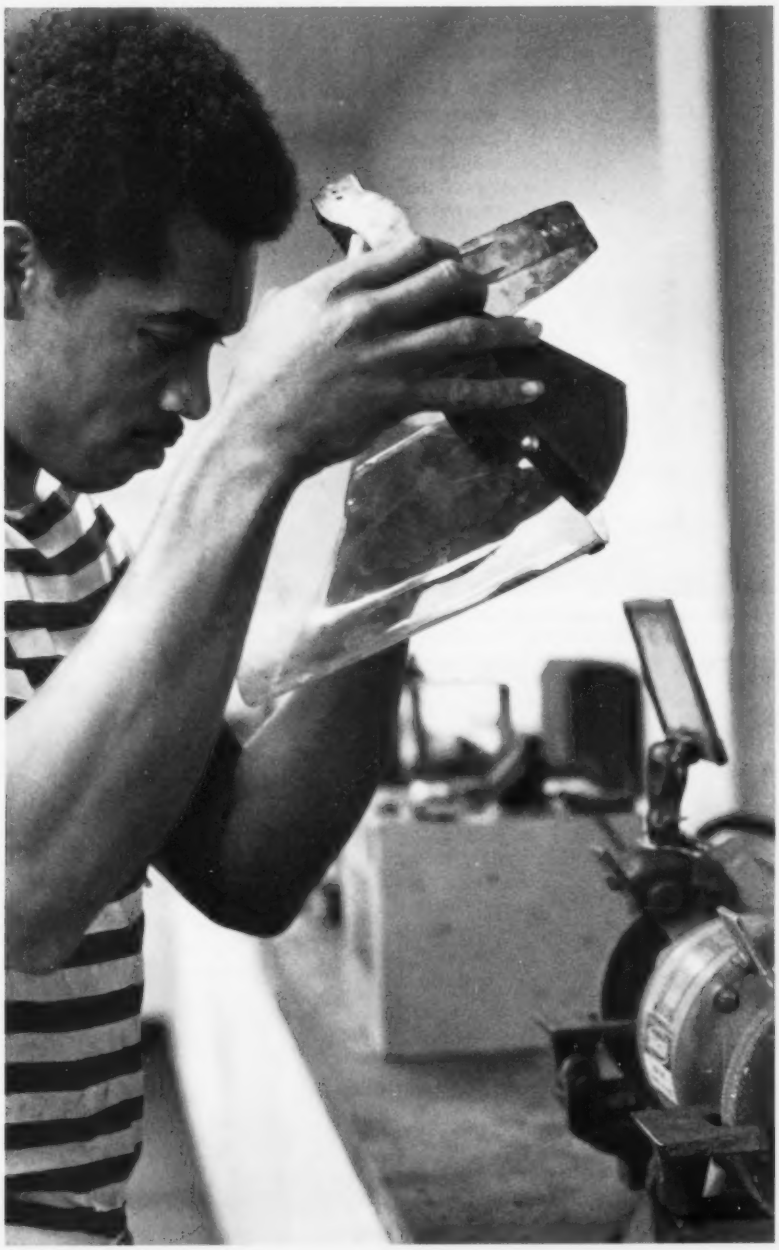
Sparks near charging batteries can cause dangerous explosions!

SHOP
SAFETY

continued

(left)
After removing the caps and covering the openings with a damp cloth, make the last cable hookup to a ground as far from the battery as possible.

(below)
Eye Protection is necessary when grinding.



flashlight. If you don't have a flashlight, use the headlights from the car giving the jump as your light source.

FREON

Problem: The service air conditioning provides far outweighs the costs by reducing fatigue and increasing driver alertness. If the air conditioning system ceases to function properly, some backyard mechanics will attempt to service it without obtaining the proper training. This presents several problems.

First, direct contact with freon R-12 in its gaseous state can cause severe frostbite. This can cause permanent tissue damage to arms, hands and eyes. Such contact usually happens while adding freon to the system.

Freon can also produce phosgene gas if exposed to engine heat. Phosgene is a poisonous gas that can damage the respiratory system.

The most common mistake made while servicing air conditioning is allowing freon to escape while charging R-12 containers on the A/C gauges. In the process the freon produces large amounts of poisonous gas because of the engine heat.

To an untrained person with some mechanical abilities, adding freon seems almost elementary.

The air conditioning system is a self-contained unit in which the compressor acts like a heart in that it pushes the freon out through the various components. When the freon reaches the evaporator, the suction side of the compressor sucks it back to the starting point.

Depending on where it is in the system, the R-12 is changing from a gas to a liquid and back again. Because of this, adding freon to the correct valve while the unit is running is critical.

To the nondiscriminating viewer there appears to be little difference in the two valves. They are there for attaching diagnostic gauges, gaining access to the system and, of course, adding freon.

However, freon *must* be added to the *suction* side of the system only. This is especially true when the unit is operating. Attempting to add R-12 to the discharge side invites disaster. Rather than sucking the freon out of the R-12 can, the compressor would pump the system's existing freon into the can. And once the can reached its full capacity, it would explode like a hand grenade.

Solution: Common knowledge and technical training will prevent most air conditioning system service accidents. However, there will always be some

continued

risks involved when servicing air conditioners.

For example, some freon will escape while it is being added to the system or when the gauge hoses are disconnected after service has been completed. Therefore, a well-ventilated room is a must as is eye protection.

Last but not least, anyone working on air conditioning should have valid training on that system. The proper techniques for handling explosive as well as poisonous gas are a necessity and not a luxury.

CONCENTRATION

In order to maintain a safe, accident-free work environment a mechanic should concentrate on five areas:

Ventilation: The shop area must be properly ventilated. Exhaust emissions, phosgene gas and heat generated by running engines decrease human performance, reduce learning ability and can be hazardous to the mechanic's health.

Lighting: The ability to see while working is extremely important, especially at night when light fixtures hanging from the ceiling cast shadows. Every mechanic should have at least two types of artificial light available. One light to hang above the work area and a second (flashlight) for pinpointing areas.

Eye Protection: Safety glasses or goggles are a must when working on or with certain chemicals and tools. However, during routine maintenance eye protection is also necessary.

Knowledge: The most important safety factor is knowledge. Knowledge of the mechanical components and how they function. And knowledge of the safety precautions to be taken when working.

Attitude: The mechanic must also have the proper attitude when s/he approaches a car. If s/he is angry, tired or not interested in the work, a serious injury could result.

These brief concepts call attention to some of the more important details of safe automotive servicing. However, safety is an on-going process in which each person is ultimately responsible for his or her well-being.

Ventilation is a must when working on cars.

Every mechanic should have at least two light sources: a good trouble light and a flashlight.

gaining 1800 SAFETY POUNDS without affecting ECONOMY

$ $ $ $ $ $ $ $ $ $ $ $ $ $

OK, the fact is: When two objects collide, the lighter one comes out second best. Therefore, the heavier an object, the less likely it is to be damaged in a collision.

This isn't good news if you're driving a 2500-pound car and everybody around you is in a vehicle weighing nearly two tons. But you can gain an 1800-pound safety advantage with one simple action: Just fasten your seat belt.

According to Ian S. Jones and R.A. Whitfield of the Insurance Institute for Highway Safety, when it comes to risk of injury in an accident, wearing your seat belt can have the same effect as making your car 1800 pounds heavier.[1]

In their analysis of vehicle downsizing and occupant injury patterns, Jones and Whitfield found that in order to enjoy the same injury odds as a belted driver in a 2500-pound car, the unbelted driver had to be in a car that weighed 4325 pounds. However, a quick look around will tell you that of all new cars being sold, only a full-sized Cadillac limousine weighs more than 4300 pounds. In fact, most new cars weigh less than 3500 pounds; some a lot less.

Of course, heavier cars are usually longer and therefore have more "crush distance" to absorb crash energy with.

Regardless of what kind of car you drive, wearing a seat belt will reduce your likelihood of being injured in an accident. Jones and Whitfield found that, when an unbelted driver and a belted driver were driving the same size cars, the belted driver had a two-thirds lower chance of injury.

The two researchers found that the total effect of vehicle weight was actually far smaller than the protection provided by safety belt use. In addition, they pointed out that the smaller a vehicle the more effective using restraints is in reducing injury risk.

Jones and Whitfield also examined injury patterns to see what effect downsizing might be having on the source of accident injuries. They noted that "injury sources did not differ markedly between large and small cars, although 'downsizing' has increased the chance of an occupant striking the windshield." They went on to explain that such a finding "is not surprising, since occupants in small cars are closer to the front structure of the car."

If you drive a downsized car the results of this study suggest that fastening your safety belt is a better idea than ever. How else can you make your car 1800 pounds heavier without losing the fuel efficiency that you and your wallet have become used to enjoying?

1
SAE Technical Paper 840199, The Effects of Restraint Use and Mass in "Downsized" Cars, by Ian S. Jones and R.A. Whitfield, Insurance Institute for Highway Safety.

why didn't the other Driver see ME?

Motorcycle lane positioning on expressways is a critical skill in an environment that is constantly changing. Being in the wrong part of the wrong lane at the wrong time can severely test your emergency maneuvering skills and leave you wondering why the other driver didn't see you.

In most cases you'll want to ride in the furthest left lane — the high speed lane. Although traffic is moving faster here than in other lanes, the left lane leaves you more flexibility.

In the left lane, you have to deal with vehicles moving into your lane from the right only. In the other lanes you have traffic coming at you from both the left and right.

When running in the left lane, the best position is in the right third of that lane, about where the right wheel track of four-wheel vehicles is. From here you can see and the traffic in front and behind you can also see you. This position also gives you the option of moving to the right quickly. You can also make easier, more visible lane changes from this position. You simply move over one-third of a lane and you're in the best position for right-hand lanes: the right side of the left third of the lane, about where the left wheel track is.

When exiting a multi-lane highway such as an expressway you want to control your lane right up to the point of actually leaving the super slab. To do this you stay close to or in the center third of the right lane. This keeps other traffic from crowding into your lane while you're still there — especially traffic attempting to take the same exit.

Avoid riding in the right third of the right lane. In this position it is difficult for traffic coming on the expressway to see you as they merge. This is especially true at dusk and during the night when your headlamp blends into the surrounding pattern of lights.

Because the motorcycling environment is in a constant state of flux, lane positioning has to be fluid and be adjusted for every change. As a result there is no one place that is best to ride.

For a more detailed look at lane positioning, see "There Are No Absolutes" in the April 1983 *DRIVER*.

DEADLY EQUATION

"This new math is killing me!" We've all heard this phrase before, haven't we? Well try this formula and see if you can get the right answer.

Question: When does 2 + 42 + 2 = negative 1?
Answer: When you are driving and...
You are ..... 2 Tired
Plus you drive ..... 42 Long
Plus you go ..... 2 Far
Equals 1 Less Person Alive!!!

This *DEADLY* equation has happened in the past to many of the members in the Air Force. We try to do too much, in too short a time, only to have an eternity to reflect on that one final mistake.

How many times have one of us had a long weekend and decided to try for a long drive? We kid ourselves into believing that we aren't too tired after working a full shift, so we just jump into the car and go for it.

"I'll just grab a cup of coffee, and keep the radio up loud." Or we say we can cut some of the time off.

"I'll just stop long enough to gas up." And how many of us are guilty of going well over the posted speed limit?

"The traffic flow is always 15-20 mph over anyway."

Right now some of you are saying to yourselves, "I've done the trip and made it back with no problems." That's right, you've made it back, this time! Each time you try it, the odds are less in your favor. Each time you are setting a very dangerous example for others to follow.

Let's get smart, people. Plan long trips, take leave when necessary, get some sleep before we start, and take time to get out of the car to walk around, relax, and unwind!

Don't become part of the *DEADLY EQUATION!!!* It can only add up to...

One Less Person Alive!!!

SSgt. Mary J. Truog, USAF
Eglin AFB FL 32542

HELP!

On the back cover of the July 84 issue of DRIVER Magazine, you pictured a seat belt demonstrator. At this time our base does not have one and we are interested in procuring one. If possible, would you please print one or more of the following items in the next issue of DRIVER Magazine:

1. The blue prints for a good seat belt demonstrator.
2. Addresses in which to order blue prints.
3. List of manufacturer, address, prices, and descriptions of prefabricated demonstrators.

Any help that you may provide in this area is greatly appreciated.

Capt. William F. Rowe, USAF
APO SF 96274

If any of you readers can help Captain Rowe, please drop him a line. DRIVER has given away the few sets of plans we once had.

OPEN LETTER TO
N.J.J. DUNNINGHAM,
APO NY 09127

In your letter to DRIVER, October 1984, you pose the question on seat belt law, to wit: Don't you care?

Well, yes, many of us do care, both in and out of the safety field. Unfortunately very few of us are in government where perhaps we ought to be.

Actually, the very thing you spoke about, 55,000,000 British in an area one half the size of Texas, is of course reversed here with great open expanses of highway where high speed trucks (and cars) travel 80+ miles per hour with nothing to hinder them but police. In our "Great West" our law makers (not the enforcers) can't understand why we should have a mandatory seat belt law, while in the heavily populated east our lawmakers prefer to protect "liberties" rather than people.

We are, however, making progress with the children. Almost all of the 48 continental states have passed laws requiring child seats or other restraints for children up to varying ages (5 years is popular) and most of them have "teeth" in them requiring various fines. Now if we could only get them heavily enforced. It really wouldn't take long to shake up the populace, but it must be done all at once (a tough thing) and equally across the country.

We Americans rarely agree (wholeheartedly) on anything including "Mom" and "Apple Pie." The apples for the pie are different across the country and so is the crust! The matronly mom in some areas becomes the svelte swinger in others. Ah, yes, safety must be a blast in a country half the size of Texas, with a legislature who follows good advice from the prime minister, at least in safety matters. Too bad you can't get them to drive on the right side of the road!

Cecil V. Anderson
Fort Devens, MA 01433

PUSH OR PULL?

I have just had the chance to read "Countersteering" in the September 1984 *DRIVER Magazine.* In the 11th paragraph, the author wrote "... s/he applies pressure (pushes) the right handle bar."

I have been taught, and feel it important to point out to new riders, *not* to push the handlebar but rather *pull* the opposite handlebar. This seems to provide a better feel for the action of the gyroscopic precession, thus a smoother initial countersteer into the turn.

Thank you for a good article.

CW3 David Stewart, USA
Coleman AAF, West Germany

*Actually an experienced rider does **both.** However, the Motorcycle Safety Foundation's research and teaching says, "**Push** in the direction you want to go." This is to save confusion, especially with new riders. Can you imagine telling new students to "pull on the right handlebar to go left." It is much easier to say "push right to go right."*

*As for a better "feel" of the "gyroscopic precession," to each his or her own. Our MSF chief instructor says he routinely **pushes** unless he's riding with one hand, then he pushes/pulls as needed.*

*The end result is the same — without confusion to the students. By the way, why do you say it is best **not** to **push**?*

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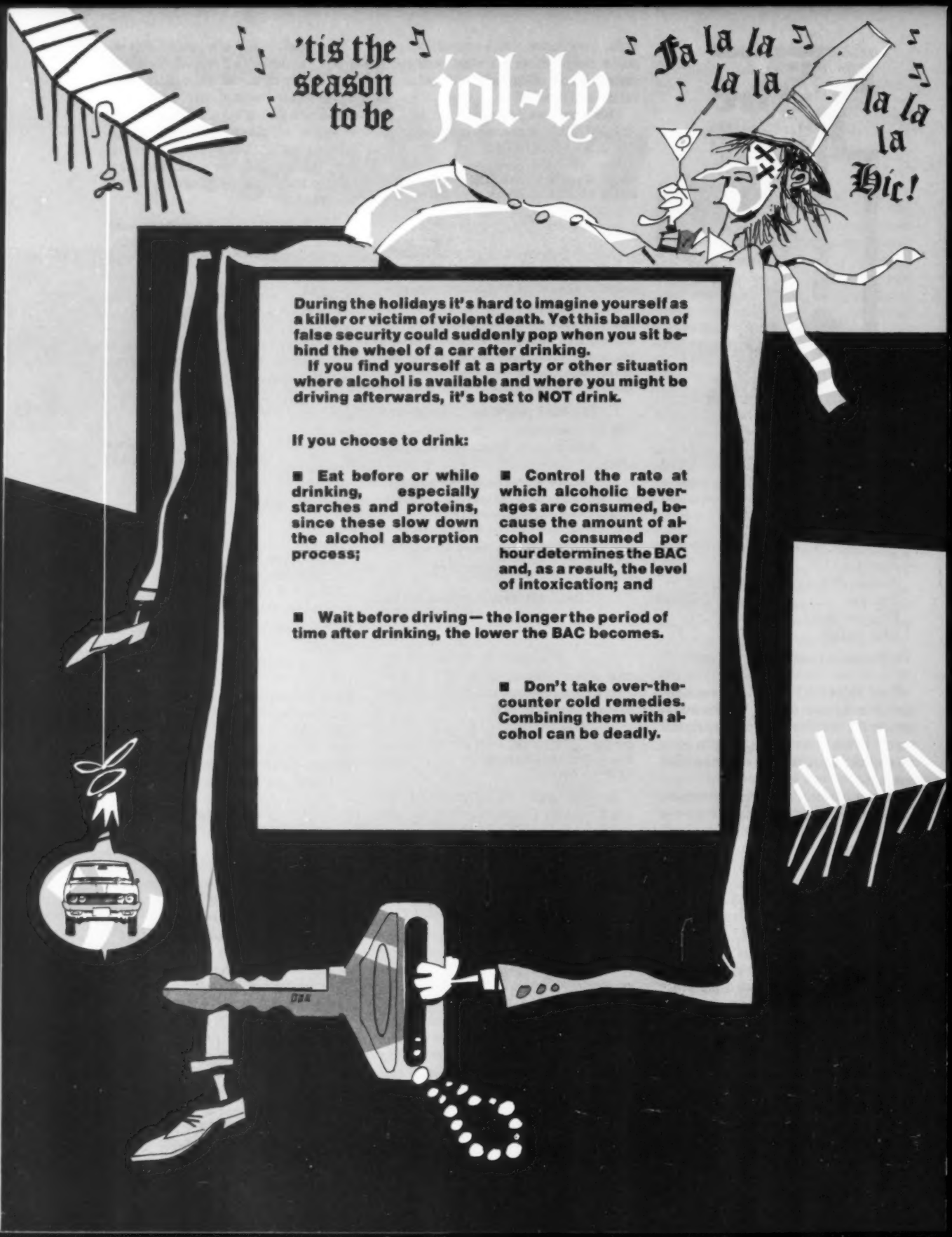
'tis the season to be jol-ly
Fa la la la la
la la la Hic!
During the holidays it's hard to imagine yourself as a killer or victim of violent death. Yet this balloon of false security could suddenly pop when you sit behind the wheel of a car after drinking.
If you find yourself at a party or other situation where alcohol is available and where you might be driving afterwards, it's best to NOT drink.
If you choose to drink:
■ Eat before or while drinking, especially starches and proteins, since these slow down the alcohol absorption process;
■ Control the rate at which alcoholic beverages are consumed, because the amount of alcohol consumed per hour determines the BAC and, as a result, the level of intoxication; and
■ Wait before driving — the longer the period of time after drinking, the lower the BAC becomes.
■ Don't take over-the-counter cold remedies. Combining them with alcohol can be deadly.